TEST REPORT

Electromagnetic compatibility of multimedia equipment

Report Reference No. ..... :	422879-3TRFEMC	
Tested by (name, function and signature) ..... :	P. Barbieri	(project handler)
Approved by (name, function and signature) ..... :	D. Guarnone	(verificator)
Date of issue ..... :	2021-05-31	
Testing Laboratory ..... :	**Nemko Spa**	
Address ..... :	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy	
Testing location	Nemko Spa	
Address ..... :	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy	
Applicant's name ..... :	**Aesys SpA**	
Address ..... :	Via Artigiani, 41 – 24060 Brusaporto (BG) – Italy	
Test specification:		
Standard ..... :	EN 55032:2015 + A11:2020 – EN 55035:2017 CISPR 32 Edition 2.0 – CISPR 35 Edition 1.0	
	Full application of the standards	☒
	Partial application of the standards	☐
Test procedure ..... :	Nemko WM L0077, WM L0177 and WM L1002	
Test Report Form No. ..... :	55032TRFEMC	
TRF Originator ..... :	Nemko Spa	
Master TRF ..... :	2019-01	

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Test item description ..... :	**Monitor**
Trade Mark ..... :	aesys
Manufacturer ..... :	Aesys SpA
Address of manufacturer ..... :	Via Artigiani, 41 – 24060 Brusaporto (BG) – Italy
Code ..... :	993202033501
Model name ..... :	CPTOU4615 LS P1L3ARIO2HS24G1WTTSPFACZ0
Ratings ..... :	220 – 240 V~, 50 / 60 Hz

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Test Report No. : 422879-3TRFEMC	2021-05-31 Date of issue

Short description of the EuT	Copy of marking plate
The E.U.T. a information monitor provided with an internal PC. The EUT use the following separatly approved radio module: - LTE/HSPA+/GSM module SIMCom model SIM7100E-PCIE - WIFI radio module Sparklan model WUBA-171GN - PMR radio module Elancitè model NF S32-002 - Antenna type Invax model DR70 The EUT is provided also with a slim soundbar code 993301701000 (Slim Soudbar 46" MC).	

Number of tested samples:	1
Serial number:	899707
Internal highest frequency generated or used:	Not declared
Classification of the E.U.T.:	☒ Class A ☐ Class B
Device type:	Wall mounted
Accessories and detachable parts included:	The E.U.T. is composed of a single unit
Other options included:	--

Testing

Date of receipt of test sample:	2021-05-13
Testing commenced on:	2021-05-17
Testing concluded on:	2021-05-28

Possible test case verdicts:

test case does not apply to the test object:	N (Not applicable)
test object does meet the requirement:	P (Pass)
test object does not meet the requirement:	F (Fail)

Symbols used in this test report

☒ The crossed square indicates that the listed condition or equipment is applicable for this report.

☐ The empty square indicates that the listed condition or equipment is not applicable for this report.

Throughout this report point is used as decimal separator.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

Verdict according to the standards on page 5:	**Pass**

PROJECT HISTORY		
Report number	**Modification to the report / comments**	**Date**
422879-3TRFEMC	First release	2021-05-31
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REMARKS		

PRODUCT VARIANTS		
Variant model	**Difference against the main model**	**Additional test performed**
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REMARKS		

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1 TEST STANDARDS

The tests were performed according to following standards and procedures.

NEMKO WM L0177: General routines for using instruments at Nemko

NEMKO WM L1002: Measurement Uncertainty - Policy and Statement

NEMKO WM L0077: General routines to perform EMC tests

EN 55032:2015 + A11:2020
Electromagnetic compatibility of multimedia equipment – Emission requirements

EN 55035:2017
Electromagnetic compatibility of multimedia equipment – Immunity requirements

The main standard(s) above contains references to other standards, which are listed below.

EN 61000-4-2:2009
Electromagnetic compatibility (EMC) -- Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test

EN 61000-4-3:2006 + A1:2008 + A2:2010
Electromagnetic compatibility (EMC) -- Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test

EN 61000-4-4:2014
Electromagnetic compatibility (EMC) -- Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test

EN 61000-4-5:2006
Electromagnetic compatibility (EMC) -- Part 4-5: Testing and measurement techniques - Surge immunity test

EN 61000-4-6:2014
Electromagnetic compatibility (EMC) -- Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields

EN 61000-4-8:2010
Electromagnetic compatibility (EMC) -- Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test

EN 61000-4-11:2010
Electromagnetic compatibility (EMC) -- Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests

The EUT comply also with the following standard.

CISPR 32 Edition 2.0
Electromagnetic compatibility of multimedia equipment – Emission requirements

CISPR 35 Edition 1.0
Electromagnetic compatibility of multimedia equipment – Immunity requirements

2 SUMMARY OF TEST RESULTS

EN 55032		
Requirement – Test	**Frequency range**	**Verdict**
Radiated disturbance	30 MHz to 6 000 MHz	P
Conducted disturbance at AC mains ports	150 kHz to 30 MHz	P
Conducted disturbance at wired network and signal/control ports	150 kHz to 30 MHz	P

EN 55035		
Requirement - Test	Ref standard	Verdict
Enclosure port – Electrostatic discharges	EN 61000-4-2	P
Enclosure port – Continuous RF electromagnetic field disturbances	EN 61000-4-3	P
AC mains power ports – Electrical fast transients/burst	EN 61000-4-4	P
DC network ports – Electrical fast transients/burst[5]	EN 61000-4-4	N
Analogue/digital data ports – Electrical fast transients/burst[5]	EN 61000-4-4	P
AC mains power ports – Surges	EN 61000-4-5	P
DC network ports – Surges[4]	EN 61000-4-5	N
Analogue/digital data ports – Surges[3]	EN 61000-4-5	P
AC mains power ports – Continuous induced RF disturbances	EN 61000-4-6	P
DC network ports – Continuous induced RF disturbances[5]	EN 61000-4-6	N
Analogue/digital data ports – Continuous induced RF disturbances[5]	EN 61000-4-6	P
Analogue/digital data ports – Broadband impulse noise disturbances, repetitive[1]	Part 4.2.7 of the standard	N
Analogue/digital data ports – Broadband impulse noise disturbances, isolated[2]	Part 4.2.7 of the standard	N
Enclosure port – Power-frequency magnetic field[6]	EN 61000-4-8	P
AC mains power ports – Voltage dips	EN 61000-4-11	P
AC mains power ports – Voltage interruptions	EN 61000-4-11	P

GENERAL REMARKS

[1] applicable only to CPE xDSL ports. Apply period based on AC mains frequency.
[2] applicable only to CPE xDSL ports. Apply all burst durations.
[3] surges are applicable to ports which satisfy all the following conditions:

- may connect directly to cables that leave the building structure,
- defined as an antenna port, a wired network port, or a broadcast receiver tuner port.

Typical ports covered include xDSL, PSTN, CATV, antenna and similar. Excluded ports are LAN and similar.
[4] applicable only to ports which, according to the manufacturer's specification, may connect directly to outdoor cables.
[5] Applicable only to ports which, according to the manufacturer's specification, support cable lengths greater than 3 m.
[6] Applicable only to equipment containing devices intrinsically susceptible to magnetic fields, such as CRT monitors, Hall effect elements, electro-dynamic microphones, magnetic field sensors or audio frequency transformers.

3 EQUIPMENT UNDER TEST

3.1 Power supply system utilised

Power supply voltage:	☒	230 V / 50 Hz / 1ϕ	☒	230 V / 60 Hz / 1ϕ
	☐	400V / 50 Hz 3PE	☐	400 V / 50 Hz 3NPE
	☐	12 V DC	☐	24 V DC

3.2 EuT operation modes

Mode	Description
1	Normal working displaying a video and a sound, and with all the radio modules linked

3.3 EuT Configuration modes

Emission: the EuT was configured to measure its highest possible radiation level. The test modes selected are according to EuT instruction manual.

Immunity: the EuT was configured to have its highest possible susceptibility against tested phenomena. The test modes selected are according to EuT instruction manual.

Mode	Description
1	The EUT has been connected to the mains with the Ethernet cable connected to a PC. The WIFI radio module was connected to an access point. The LTE/HSPA+/GSM radio module was connected to a radio communication tester. The PMR radio module was controlled by an external remote control.

3.4 Input/Output Ports

Port	Name	Type*	Cable Max. >3m	Cable Shielded	Description
0	Enclosure	N/E	—	—	—
1	AC mains	AC	☒	☐	Three wires cable
2	Ethernet line	TP	☒	☒	Standard cable

*Note:

AC = AC Power Port DC = DC Power Port N/E = Non-Electrical

I/O = Signal/Control Input or Output Ports TP = Telecommunication Ports ANT = Antenna Ports

3.5 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
AE	PC	—	—	—
AE	Radio communication tester	R&S	CMW 290	—
AE	PMR Remote control	Okeenea	TX1-BUZ	—
AE	IR Remote control	Meliconi	Speedy 2 combo	—

Note: * Use

EUT - Equipment Under Test

AE - Auxiliary/Associated Equipment (Not Subjected to Test)

SIM - Simulator (Not Subjected to Test)

3.6 Performance level

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level defined by its manufacturer or the requestor of the test, or agreed between the manufacturer and the purchaser of the product.

Definition related to the performance level:

☐	based on the used product standard
☒	based on the declaration of the manufacturer, requestor or purchaser

The ping command has been used to check the right work of the Ethernet line. The BER function of the CMW290 has been used to check the right work of the radio link. Acoustic demodulation on the telephone side has been monitored.

Criterion A:
The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Criterion B:
During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test.

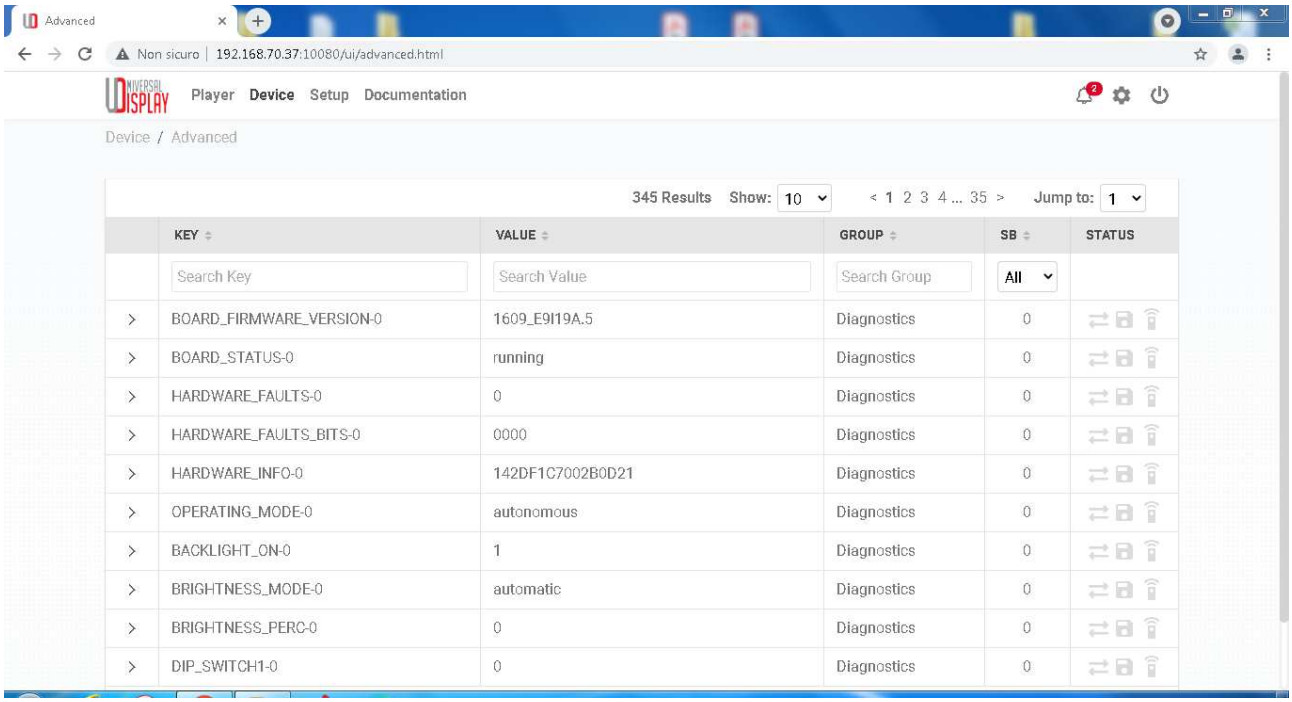
After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment is used as intended.

The performance level may be replaced by a permissible loss of performance. If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Criterion C:
Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed.

Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

The right work of the EUT has been check with the "ping" windows command and with a dedicated browser page (UDisplay – see the below). The PMR radio module has been check reproducing a vocal message after pressing a button on the remote control. Loss of link with radio module was not allowed. Distortion on the displayed video was not allowed.


Advanced
Non sicuro | 192.168.70.37:10080/ui/advanced.html
Player Device Setup Documentation
Device / Advanced
345 Results Show: 10 < 1 2 3 4 ... 35 > Jump to: 1
KEY VALUE GROUP SB STATUS
Search Key Search Value Search Group All
BOARD_FIRMWARE_VERSION-0 1609_E9I19A.5 Diagnostics 0
BOARD_STATUS-0 running Diagnostics 0
HARDWARE_FAULTS-0 0 Diagnostics 0
HARDWARE_FAULTS_BITS-0 0000 Diagnostics 0
HARDWARE_INFO-0 142DF1C7002B0D21 Diagnostics 0
OPERATING_MODE-0 autonomous Diagnostics 0
BACKLIGHT_ON-0 1 Diagnostics 0
BRIGHTNESS_MODE-0 automatic Diagnostics 0
BRIGHTNESS_PERC-0 0 Diagnostics 0
DIP_SWITCH1-0 0 Diagnostics 0

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

Nemko Spa
Via del Carroccio, 4
20853 Biassono (MB) – Italy

Tests site/benches are in accordance with applicable standard/s, and have been utilized under Nemko Spa testing engineer

4.2 Environmental conditions

In the laboratory, the following ambient conditions are respected for each test reported below:

Ambient temperature:	18 ÷ 33 °C (1)
Relative Humidity:	25 ÷ 70 % (2)
Atmospheric pressure:	860 ÷ 1060 hPa

(1) For luminaire, temperature during tests was verified to be within 18 ÷ 30 °C
(2) During ESD test, humidity was verified to be within 30 ÷ 60 %

The following instruments are used to monitor the environmental conditions:

Equipment	Manufacturer	Model	Serial N°
Thermo-hygrometer data loggers	Testo	175-H2	20012380/305
Thermo-hygrometer data loggers	Testo	175-H2	38203337/703
Barometer	Castle	GPB 3300	072015

4.3 Statement of the measurement uncertainty

The measurement uncertainty was calculated for each test and quantity listed in this test report, according to CISPR 16-4-2 and other specific test standard and is documented in Nemko Spa working manual WML1002.

The assessment of conformity for each test performed on the equipment is performed not taking into account the measurement uncertainty. The two following possible verdicts are stated in the report:

P (Pass) - The measured values of the equipment respect the specification limit at the points tested. The specific risk of false accept is up to 50% when the measured result is close to the limit.

F (Fail) - One or more measured values of the equipment do not respect the specification limit at the points tested. The specific risk of false reject is up to 50% when the measured result is close to the limit.

Hereafter Nemko's measurement uncertainties are reported:

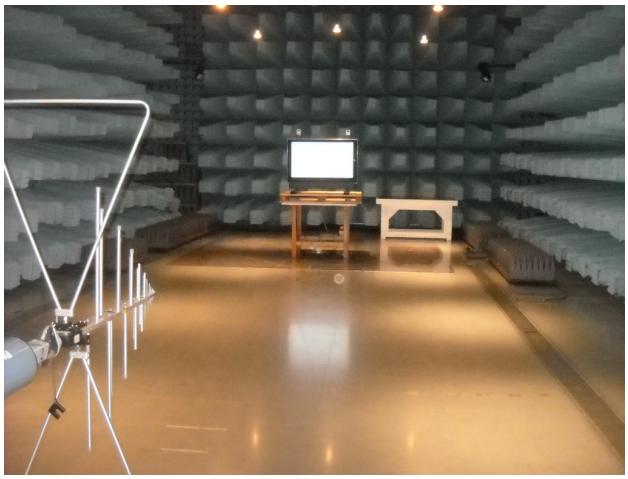
Test	Range	Measurement Uncertainty	Notes
Radiated Disturbance 10m Chamber	Antenna distance 3 m, 10 m 0.009 ÷ 200 MHz	5.0 dB	(1)
	Antenna distance 1 m, 3 m, 10 m 200 ÷ 1000 MHz	5.2 dB	(1)
	Antenna distance 1 m, 3 m, 10 m 1 ÷ 6 GHz	5.2 dB	(1)
	Antenna distance 1 m, 3 m 6 ÷ 18 GHz	5.5 dB	(1)
	Antenna distance 1 m, 3 m 18 ÷ 40 GHz	7.2 dB	(1)
Radiated Disturbance with large loop antenna system (LLAS)	0.009 ÷ 30 MHz	3.3 dB	(1)
Conducted Disturbance	0.02 ÷ 150 kHz with AMN	3.8 dB	(1)
	150 kHz ÷ 30 MHz with AMN	3.4 dB	(1)
	150 kHz ÷ 30 MHz with AAN	4.6 dB	(1)
	9 kHz ÷ 30 MHz with voltage probe	2.9 dB	(1)
	150 kHz ÷ 30 MHz with current probe	2.9 dB	(1)
Clicks	9 ÷ 150 kHz	3.8 dB	(1)
	150 kHz ÷ 30 MHz	3.4 dB	(1)
Disturbance Power	30 MHz ÷300 MHz	4.5 dB	(1)
Frequency	10 Hz ÷ 1 kHz	0.2 %	(1)
	1 kHz ÷ 40 GHz	10^{-6}	(1)
Harmonic Current Emission	50 Hz ÷ 2 kHz	3 %	(1)
Fluctuation and Flikers	Fluctuation	0.05 %	(1)
	Flikers	5 %	(1)
Radiated Immunity Anechoic Chambers	20 MHz ÷ 6 GHz	3.4 dB	(1) (3)
Radiated Immunity TEM Cell	0.01 ÷ 200 MHz	3.0 dB	(1) (3)
Bulk Current	1 ÷ 200 MHz	3.0 dB	(1)
Immunity to conducted disturbances	9 kHz ÷ 230 MHz	3.0 dB	(1)
ESD Immunity	Voltage, Current, Rise time, Duration	(2)	(1)
Burst Immunity	Voltage, frequency, burst period and duration, rise time and pulse width	(2)	(1)
Surge Immunity	Voltage, Current, Rise time, Duration	(2)	(1)
DIPS, Interruption and Voltage duration Immunity	Amplitude	5 %	(1)
	Duration	5 %	
Impulse Magnetic Field Immunity	Peak Current	10 %	(1) (3)
	Rise time, Duration	20 %	
Power Frequency Magnetic Field Immunity	16.7 Hz, 50 Hz, 60 Hz	2.0 dB	(1) (3)
Damped Oscillatory Wave Immunity Ring Wave Immunity	Voltage, front time, frequency 100 kHz, 1 MHz	(2)	(1)
Damped Magnetic Field	Amplitude: 100 kHz, 1 MHz	3 dB	(1)
	Frequency: 100 kHz, 1 MHz	10 %	
Low Frequency Immunity	15 Hz ÷ 150 kHz	2.2 dB	(1)
Automotive transients Immunity	Voltage, rise time, duration time Impulses 1, 2a, 2b, 3a, 3b and 4	(2)	(1)
Automotive transients Emission	Amplitude, Time	10 %	(1)
EMF for Lighting Equipment	-	25 %	(1)
Electromagnetic fields (EMF)	Magnetic, Electric and Electromagnetic fields: 0 Hz ÷ 40 GHz	25 %	(1)
Electrical quantities (voltage, current, resistance)	AC/DC Voltage 10 mV ÷ 1000 V 0÷100 kHz AC/DC Current 0.1 mA ÷ 400 A 0÷1 kHz Resistance 100 mΩ ÷ 10 MΩ	2.5 %	(1)

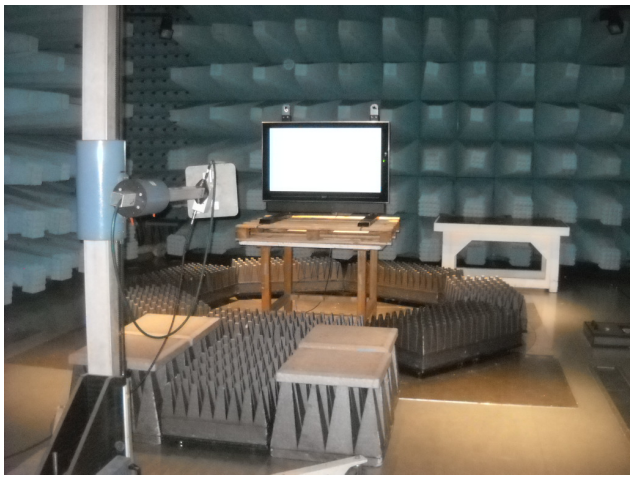
NOTES:
(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 %
(2) The instruments used for this immunity test is according to the tolerances requested by the applicable standard
(3) The reported expanded uncertainty of measurement is related to the stimulus quantity

5 TEST CONDITIONS AND RESULTS

5.1 Radiated disturbance in the frequency range 30 MHz to 6 000 MHz

5.1.1 Photo documentation of the test set-up





5.1.2 Test method according to EN 55032

Measurements were made on a semi anechoic chamber. Preliminary measurements were performed at an antenna to EUT separation distance of 10 meters and 3 meters with the receive antenna located at a fixed height (from 1 to 4 meter) in both horizontal and vertical polarities. Final measurements were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.

5.1.3 Limits for radiated emissions at frequencies up to 1 GHz for class B equipment at a measuring distance of 10 m

Frequency (MHz)	Limit (dBµV/m) - Quasi-Peak
30 TO 230	30
230 TO 1 000	37

5.1.4 Limits for radiated emissions at frequencies above 1 GHz for class B equipment at a measurement distance of 3 m

Frequency (MHz)	Limit (dBµV/m) - Average	Limit (dBµV/m) – Peak
1 000 TO 3 000	50	70
3 000 TO 6 000	54	74

5.1.5 Limits for radiated emissions at frequencies up to 1 GHz for class A equipment at a measuring distance of 10 m

Frequency (MHz)	Limit (dBµV/m) - Quasi-Peak
30 TO 230	40
230 TO 1 000	47

5.1.6 Limits for radiated emissions at frequencies above 1 GHz for class A equipment at a measurement distance of 3 m

Frequency (MHz)	Limit (dBµV/m) - Average	Limit (dBµV/m) – Peak
1 000 TO 3 000	56	76
3 000 TO 6 000	60	80

5.1.7 Test result

Verdict:	☒ P ☐ F ☐ N
Frequency range:	30 MHz – 6 000 MHz
Kind of test site:	Semi anechoic chamber
Measurement distance:	3 m and 10 m

Remarks: The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes.

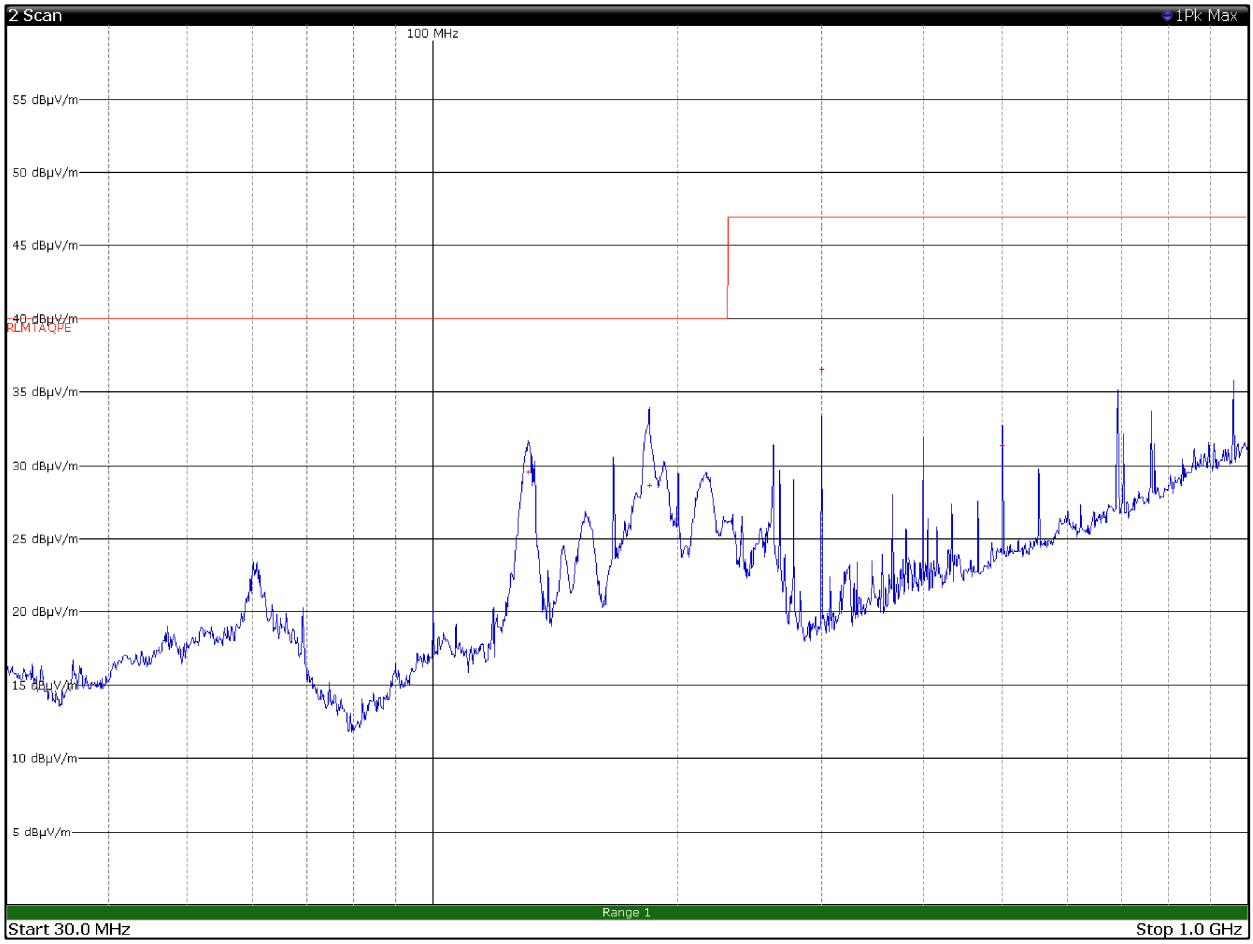
- If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.
- If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.
- If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz.
- If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

5.1.9 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Trilog Broadband Antenna	Schwarzbeck	VULB 9162	9162-025
Bilog antenna (1 ÷ 18 GHz)	Schwarzbeck	STLP 9148	9148-123
Broadband preamplifier (1 ÷ 18 GHz)	Schwarzbeck	BBV 9718	9718-137
EMI receiver (2 Hz ÷ 44 GHz)	R&S	ESW44	101620
Controller	Maturo	FCU3.0	10041
Tilt antenna mast	Maturo	TAM4.0-E	10042
Turntable	Maturo	TT4.0-5T	2.527
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947

5.1.8 Test protocol

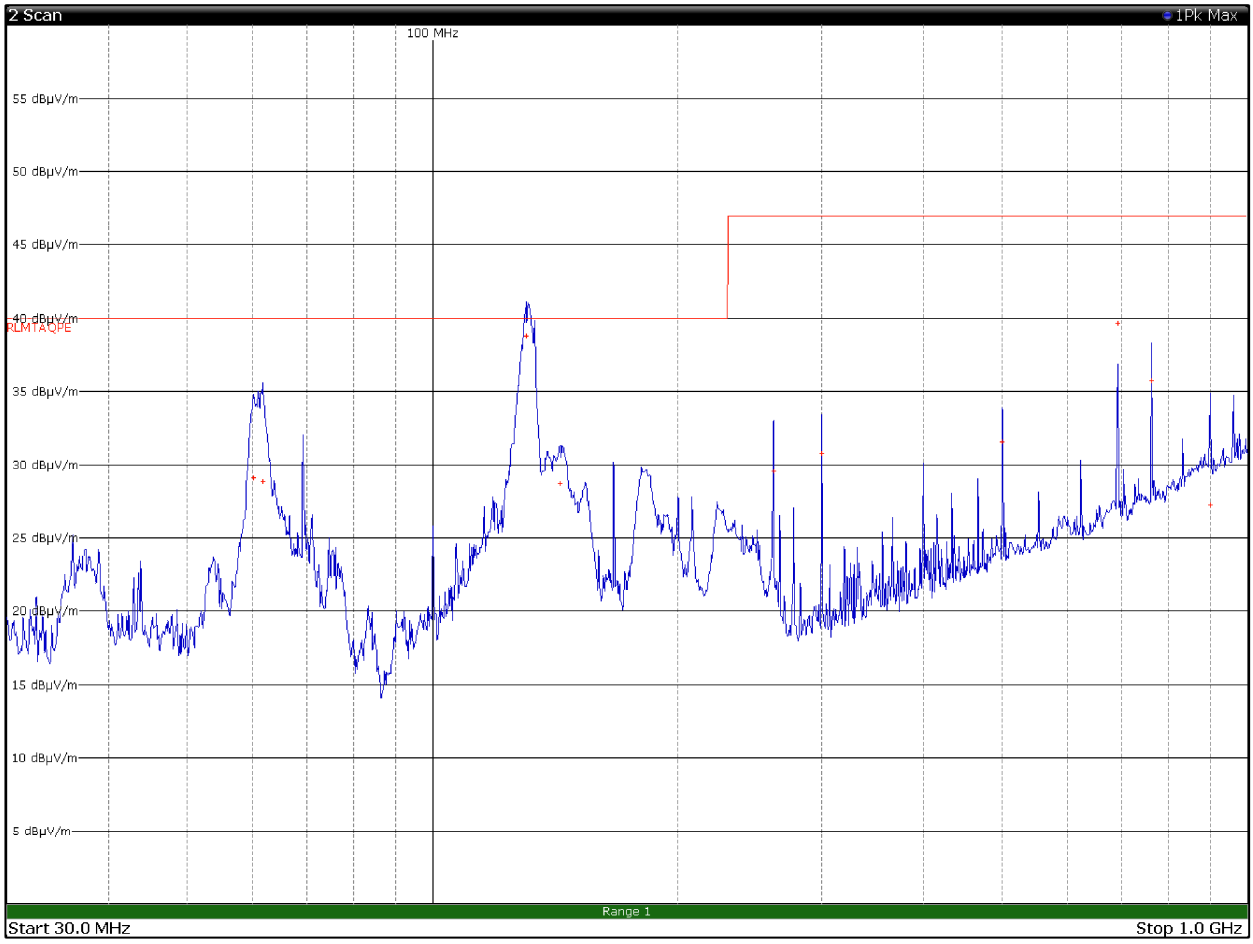
Antenna polarization: Horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 30 MHz to 1 GHz @ 10 m
Same result at 50 and 60 Hz



Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
130.8600	29.6	40.0	-10.4	QP
184.3200	28.7	40.0	-11.3	QP
300.0000	36.5	47.0	-10.5	QP
500.0100	31.4	47.0	-15.6	QP

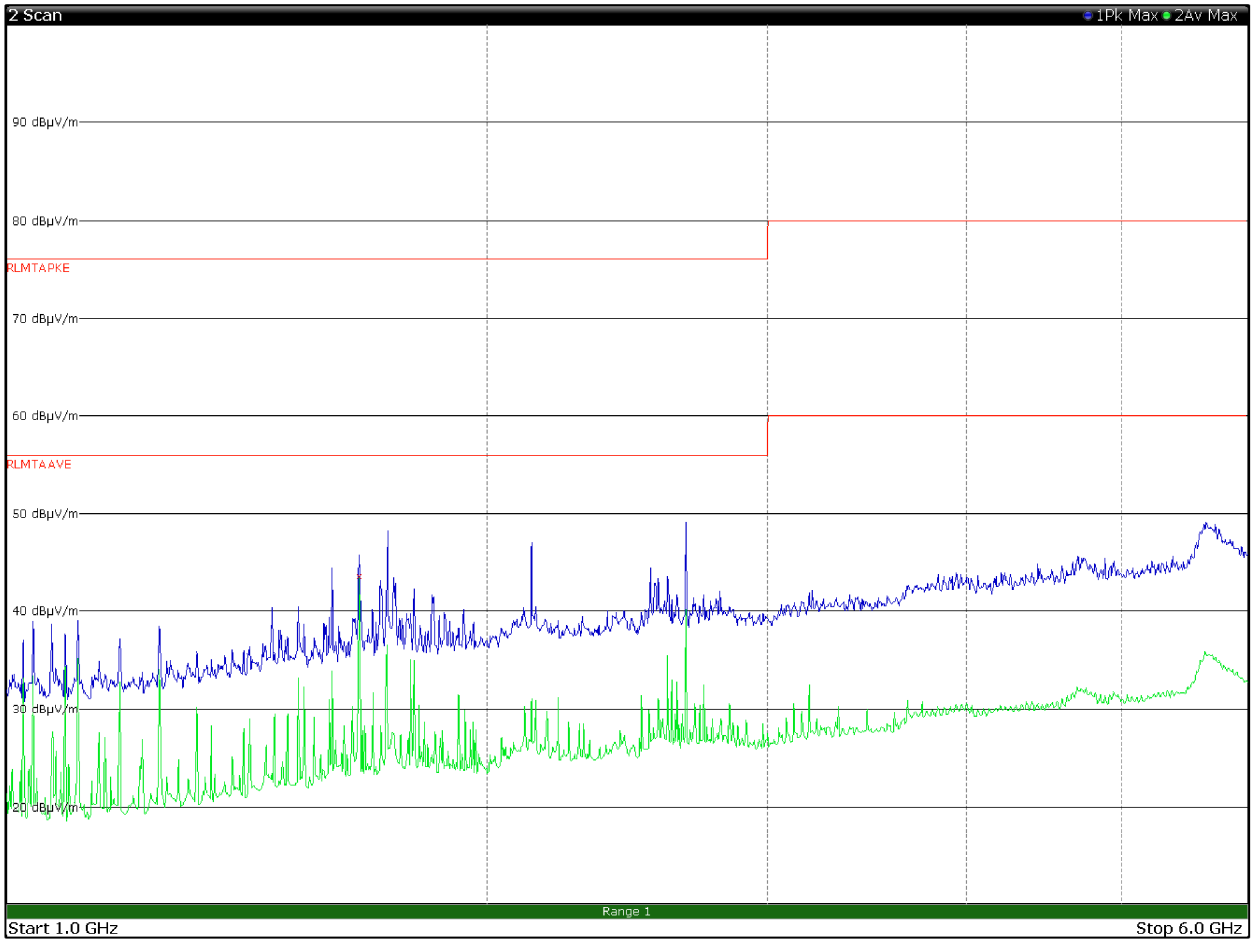
Antenna polarization: Vertical
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 30 MHz to 1 GHz @ 10 m
Same result at 50 and 60 Hz

Verdict: Pass



Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
60.2700	29.1	40.0	-10.9	QP
61.8900	28.9	40.0	-11.1	QP
130.2900	38.8	40.0	-1.2	QP
143.0700	28.8	40.0	-11.2	QP
261.8400	29.6	47.0	-17.4	QP
300.0000	30.8	47.0	-16.2	QP
500.0100	31.6	47.0	-15.4	QP
692.3700	39.7	47.0	-7.3	QP
761.6700	35.8	47.0	-11.2	QP
900.1500	27.3	47.0	-19.7	QP

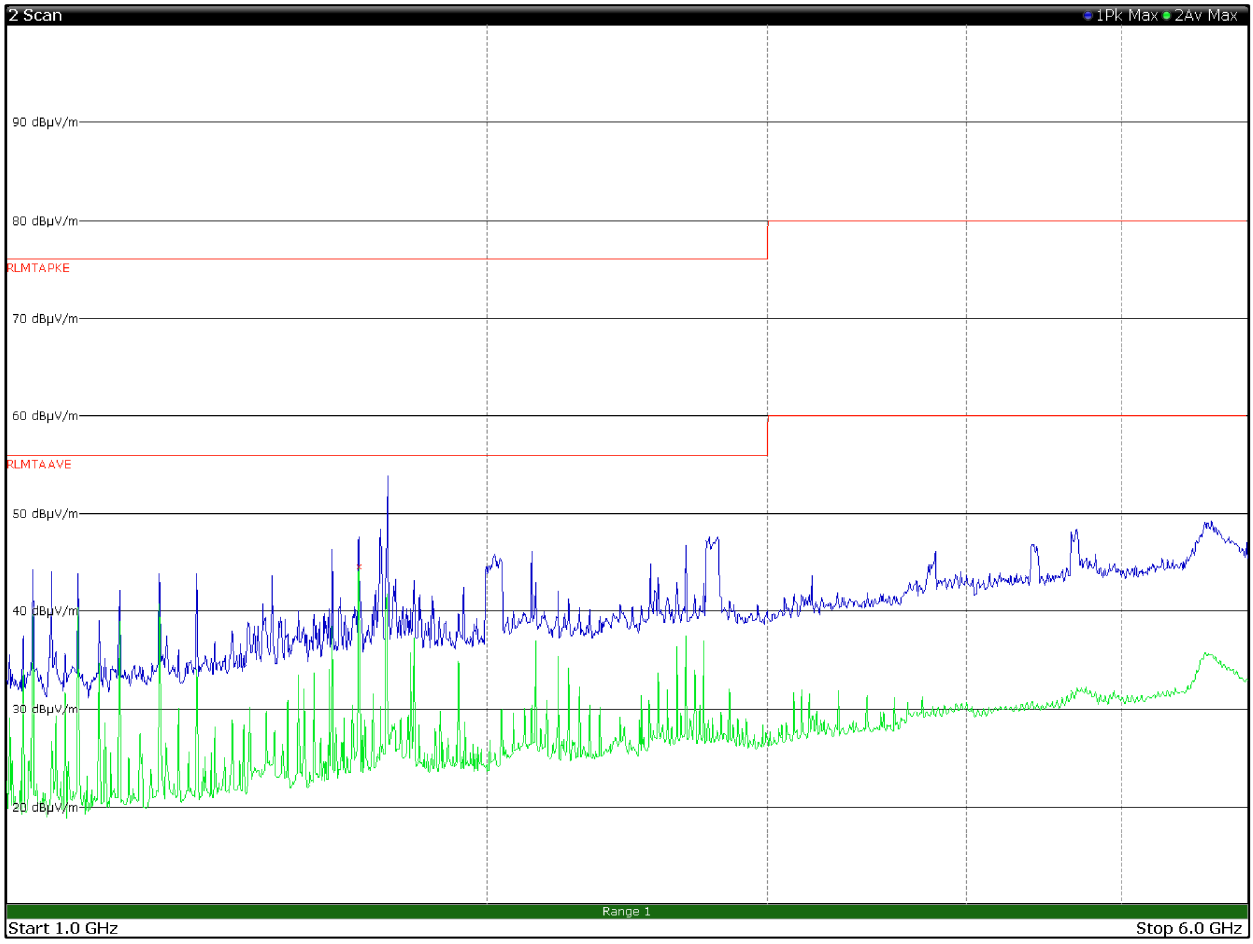
Antenna polarization: Horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 1 GHz to 6 GHz @ 3 m
Same result at 50 and 60 Hz



Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1664.0000	43.6	56.0	-12.4	Av

Antenna polarization: Vertical
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 1 GHz to 6 GHz @ 3 m
Same result at 50 and 60 Hz

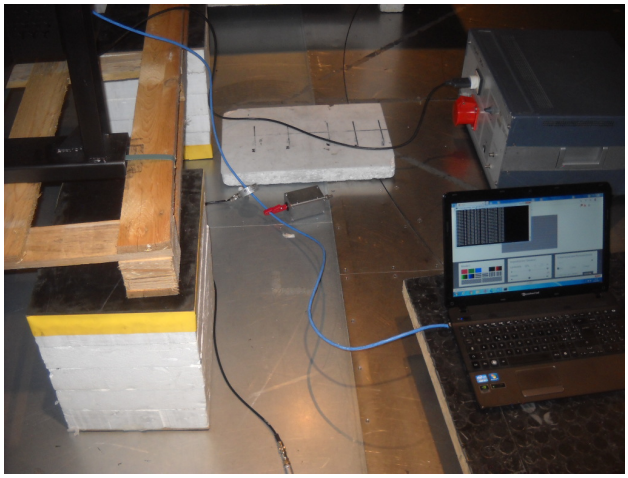
Verdict: Pass



Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1662.0000	44.6	56.0	-11.4	Av

5.2 Conducted disturbance in the frequency range 150 kHz to 30 MHz

5.2.1 Photo documentation of the test set-up



5.2.2 Test method according to EN 55016-2-1

Measurements were made on a ground plane that extends one meter minimum beyond all sides of the system under test. All power was connected to the system through Line Impedance Stabilization Networks (LISN). Conducted voltage measurements on mains lines were made at the output of the LISN. All tested telecommunications lines were connected to an Impedance Stabilization Network (ISN) and conducted voltage measurements on telecommunications lines were made at the output of the ISN. Where an ISN was not appropriate or available measurements were made using a Capacitive Voltage Probe and Current probe.

5.2.3 Limits for conducted emissions from the AC mains power ports of class B equipment

Frequency (MHz)	Limit (dBµV)	
	Quasi-Peak	Average
0.15 TO 0.50	66 to 56*	56 to 46*
0.50 TO 5	56	46
5 TO 30	60	50

*The limits decrease linearly with the logarithm of the frequency

5.2.4 Limits for conducted emissions from the AC mains power ports of class A equipment

Frequency (MHz)	Limit (dBµV)	
	Quasi-Peak	Average
0.15 TO 0.50	79	66
0.50 TO 30	73	60

5.2.5 Limits for asymmetric mode conducted emissions for class B equipment

Frequency (MHz)	Limit (dBµV)	
	Quasi-Peak	Average
0.15 TO 0.50	84 to 74*	74 to 64*
0.50 TO 30	74	64

*The limits decrease linearly with the logarithm of the frequency

Frequency (MHz)	Limit (dBµA)	
	Quasi-Peak	Average
0.15 TO 0.50	40 to 30*	30 to 20*
0.50 TO 30	30	20

*The limits decrease linearly with the logarithm of the frequency

5.2.6 Limits for asymmetric mode conducted emissions for class A equipment

Frequency (MHz)	Limit (dBµV)	
	Quasi-Peak	Average
0.15 TO 0.50	97 to 87*	84 to 74*
0.50 TO 30	87	74

*The limits decrease linearly with the logarithm of the frequency

Frequency (MHz)	Limit (dBµA)	
	Quasi-Peak	Average
0.15 TO 0.50	53 to 43*	40 to 30*
0.50 TO 30	43	30

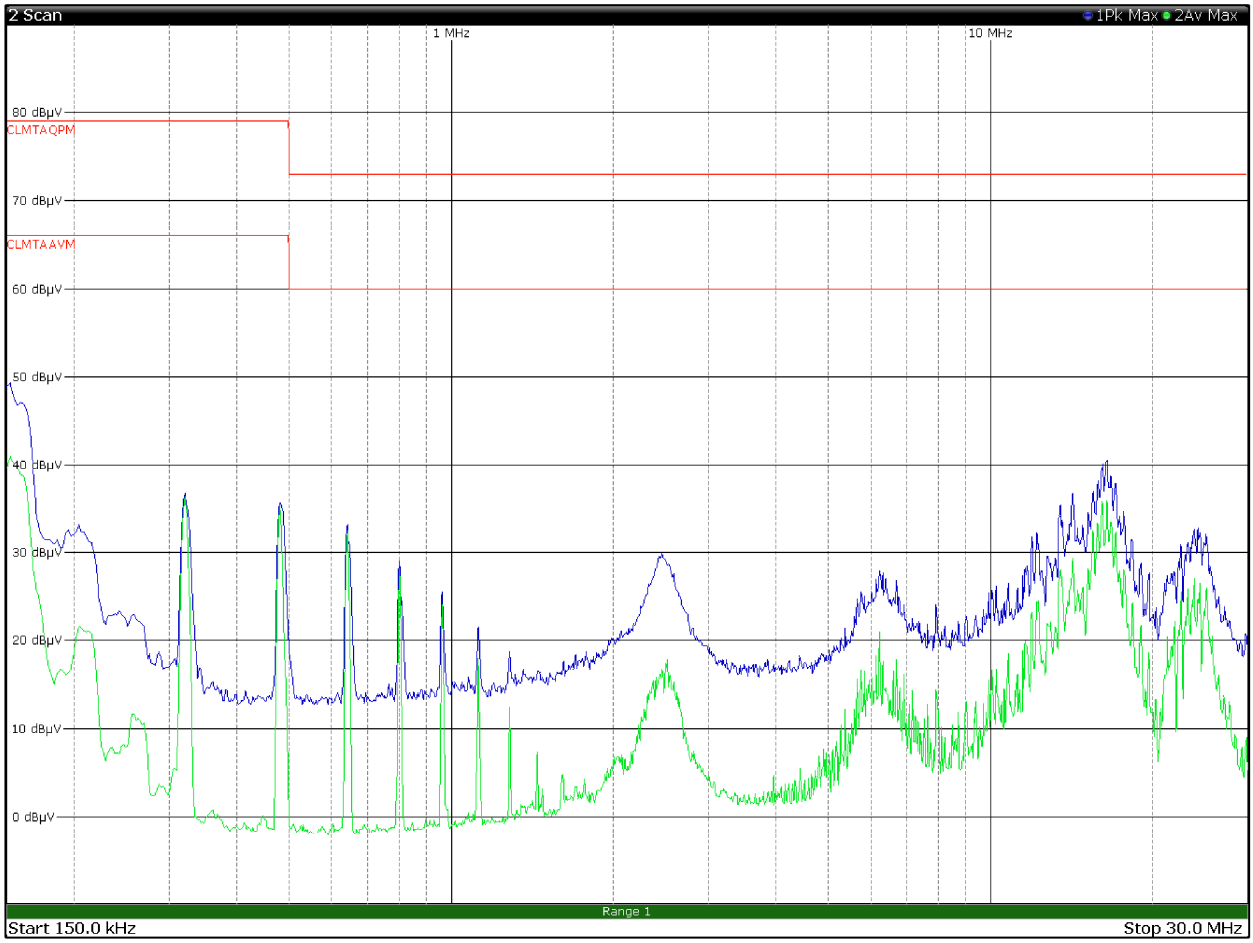
*The limits decrease linearly with the logarithm of the frequency

5.2.7 Test result

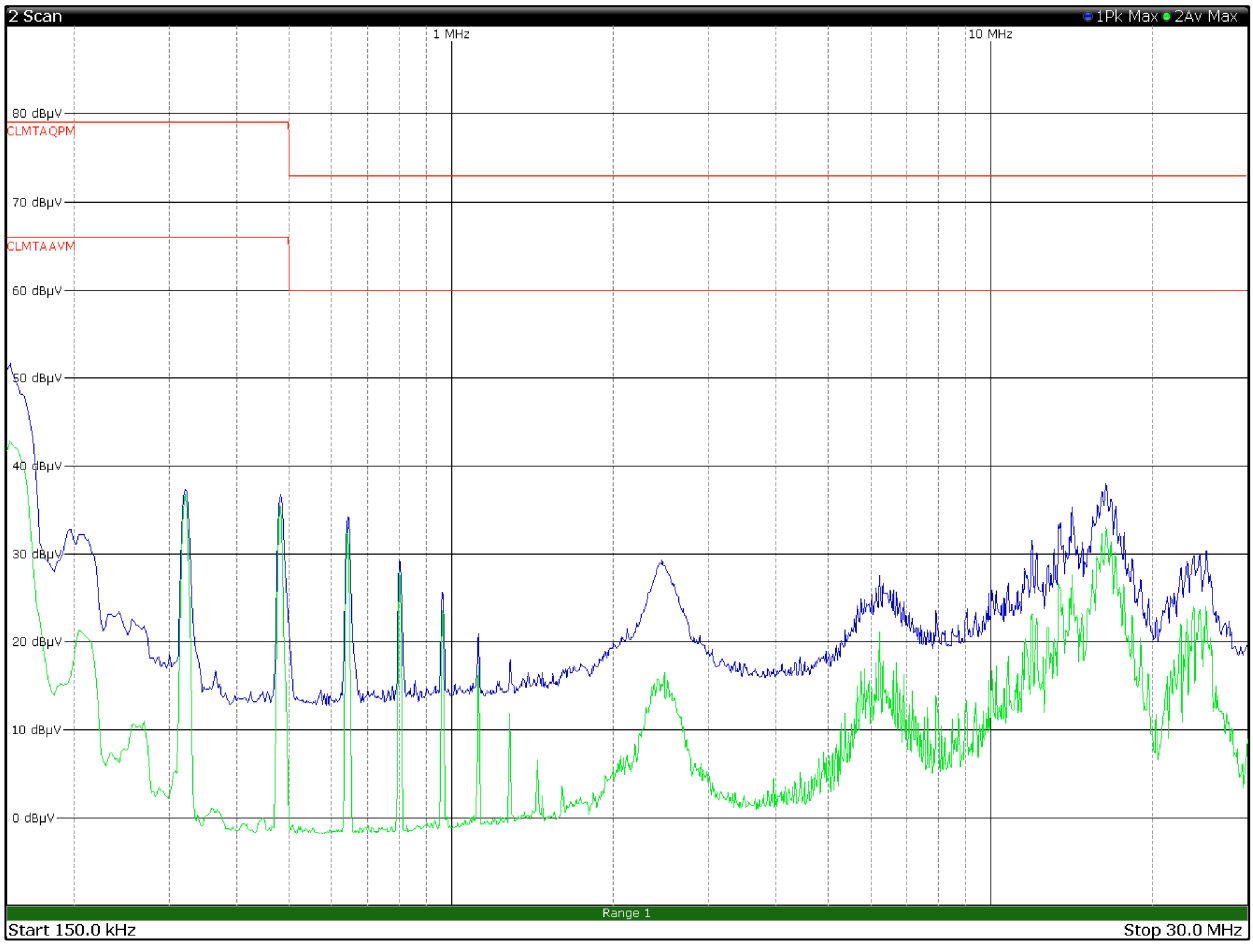
Verdict for AC mains power ports:	☒ P ☐ F ☐ N
Verdict for wired network ports:	☒ P ☐ F ☐ N
Frequency range:	0.15 MHz – 30 MHz
Kind of test site:	Shielded room
Remarks:	

5.2.8 Test protocol

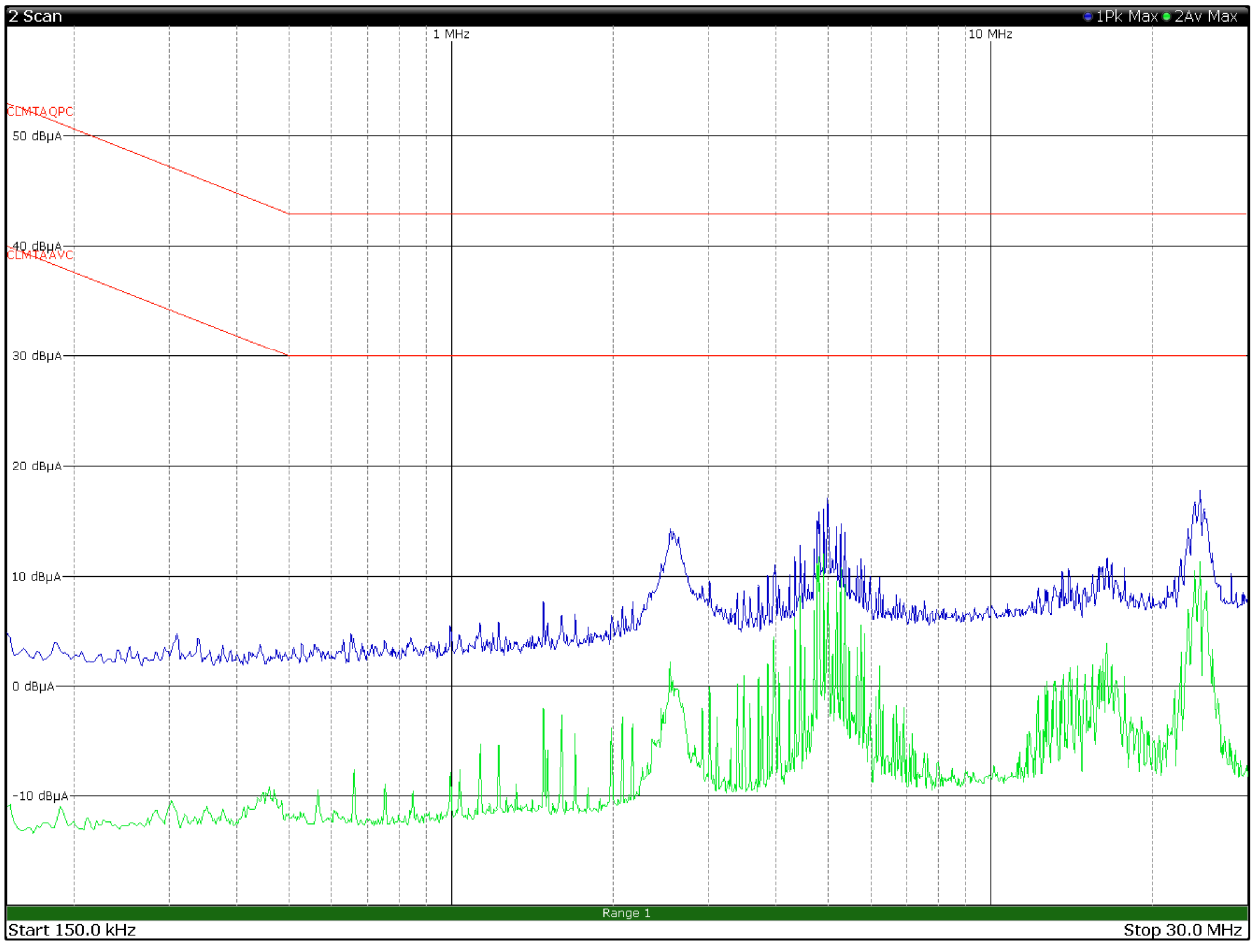
Test point: Phase line Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Same result at 50 and 60 Hz



Test point:	Neutral line	Verdict: Pass
Operation mode:	1	
Configuration mode:	1	
Remarks:	Same result at 50 and 60 Hz	



Test point: Ethernet line Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Same result at 50 and 60 Hz

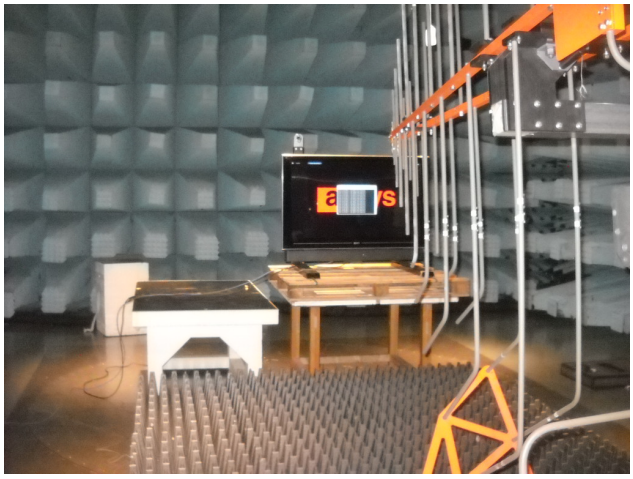


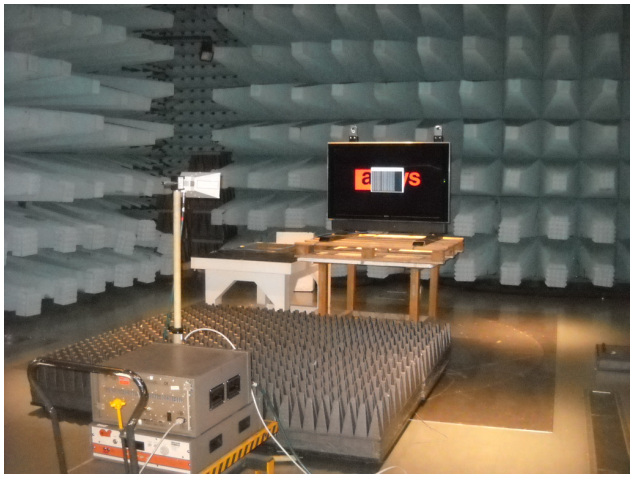
5.2.9 Test equipment used

Equipment	Manufacturer	Model	Serial N°
EMI receiver (2 Hz ÷ 44 GHz)	R&S	ESW44	101620
LISN 9 kHz ÷ 30 MHz	R&S	ESH2-Z5	872 460/041
Current clamp probe	R&S	ESH2-Z1	891 923/18
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947

5.3 Immunity to radio-frequency electromagnetic fields (AM)

5.3.1 Photo documentation of the test set-up





5.3.2 Test method according to EN 61000-4-3

The test allows estimating of the radiated immunity of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 80 MHz to 6000 MHz. The interference is applied on the enclosure of the equipment by using transmitting antennas. Measurements are made in a fully anechoic chamber and the indicated field strength is pre-calibrated prior to placement of the system under test.

5.3.3 Test specification for swept test

Frequency range:	80 MHz to 1 000 MHz			
Field strength:	3 V/m			
EuT - antenna separation:	3 m			
Modulation:	AM with 80 % in depth and 1 kHz sine wave			
Frequency step:	1 % with 2 s dwell time			
Antenna polarisation:	horizontal		vertical	
Antenna position:	front	rear	left	right

5.3.3 Test specification for spot test

Frequencies required:	1 800 MHz	2 600 MHz	3 500 MHz	5 000 MHz
Field strength:	3 V/m			
EuT - antenna separation:	3 m			
Modulation:	AM with 80 % in depth and 1 kHz sine wave			
Frequency step:	1 % with 2 s dwell time			
Antenna polarisation:	horizontal		vertical	
Antenna position:	front	rear	left	right

5.3.4 Test result

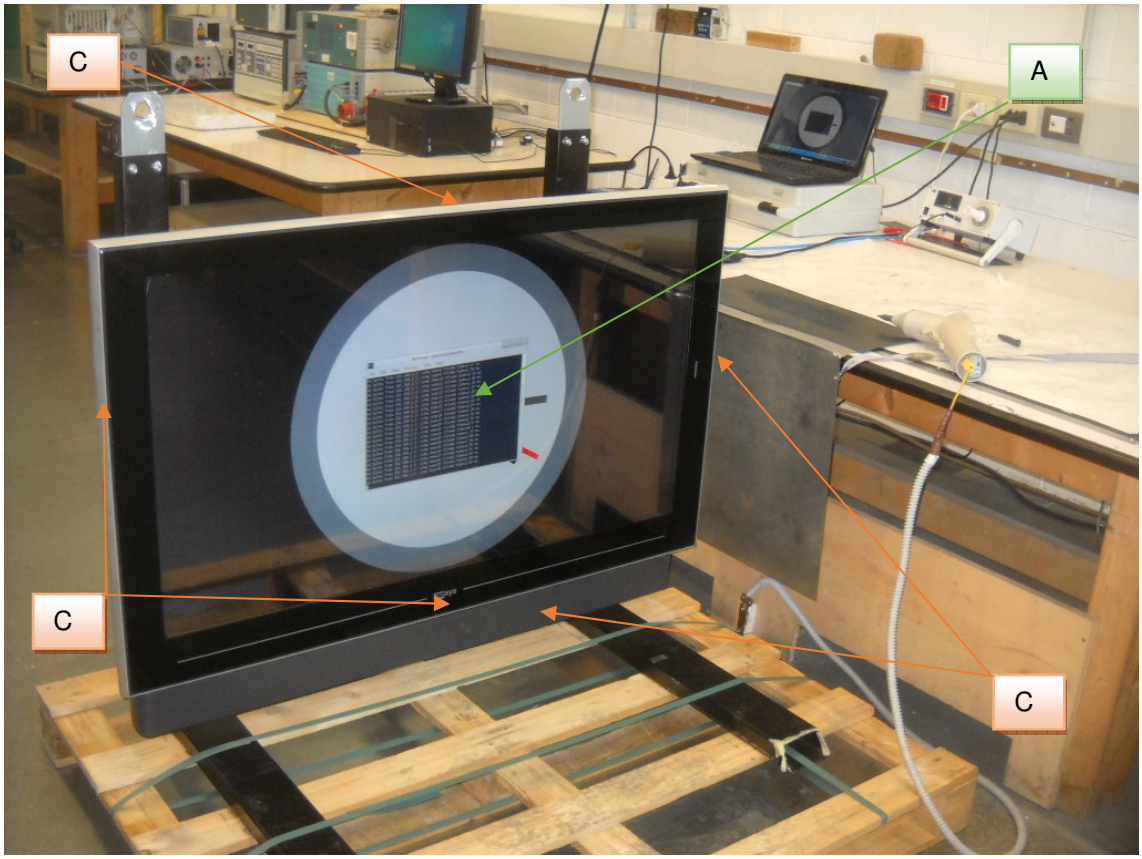
Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	A
Operation mode:	1
Configuration mode:	1
Kind of test site:	Anechoic chamber
Remarks: the performance criterion achieved during test was A, nothing happened during test.	

5.3.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Log periodic antenna (20 ÷ 6000 MHz)	AR	AT6026A	0330878
Microwave horn antenna (1 ÷ 18 GHz)	Schwarzbeck	BBHA 9120 D	D1874
RF generator (0.1 ÷ 12750 MHz)	R&S	SMB100A	180431
RF Amplifier (10KHz ÷ 225MHz)	AR	1000A225	0336745
RF Amplifier (200 MHz÷1000 MHz)	IFI	CMX100010-SMCC1000	L448A-0108
RF amplifier (0.8 ÷ 4.2 GHz)	AR	50S1G4A	301049
Broadband amplifier (4.2 ÷ 18 GHz)	AR	20T4G18	300792
Bidirectional Coaxial coupler	AR	DC7144	301249
Power sensor	R&S	NRP18AN	100990
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947

5.4 Immunity to electrostatic discharges

5.4.1 Photo documentation of the test set-up



C = Contact discharge – A = Air discharge

5.4.2 Test method according to EN 61000-4-2

The test is intended to demonstrate the immunity of equipment subjected to static electricity discharges from operators directly and to adjacent objects. The table-top equipment under test is placed on a wooden table, 0.8 m high, standing on the ground reference plane. A horizontal coupling plane (HCP) is placed on the table. The EUT and the cables are isolated from the coupling plane by an insulating support 0.5 mm thick. The floor standing equipment is isolated from the ground reference plane by an insulating support about 0.1 m thick. The vertical coupling plane (VCP) of dimensions 0.5 m x 0.5 m is placed parallel to, and positioned at a distance of 0.1 m from, the EUT. Air discharges are applied to non-metallic parts of the system. Contact discharges are applied to all accessible metallic parts. Discharges are also applied to the Horizontal and Vertical Coupling Planes.

5.4.3 Test specification

Contact discharge voltage:	4 kV	
Air discharge voltage:	8 kV	
Discharge impedance:	330 Ω/150 pF	
Time between successive discharges:	≥ 1 s	
Number of discharges:	≥ 10	
Type of direct discharge:	air discharge	contact discharge
Type of indirect discharge:	contact discharge	
Polarity:	positive	negative

5.4.4 Test result

Discharge location	Type of discharge
Horizontal coupling plane (HCP)	Contact
Vertical coupling plane (VCP)	Contact
Enclosure	Contact
Display	Air

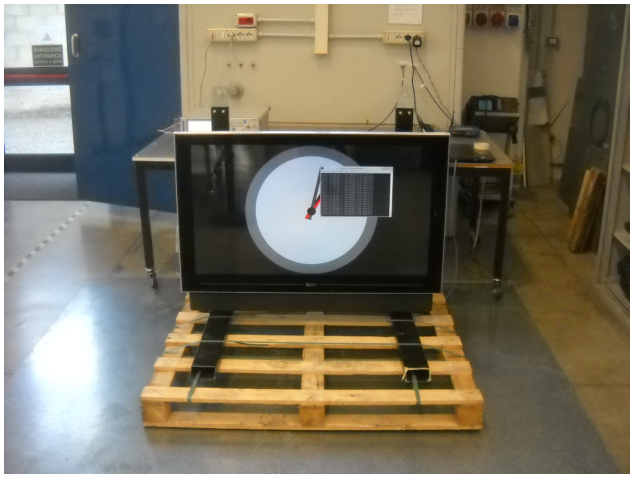
Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	B
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks: the performance criterion achieved during test was A, nothing happened during test.	

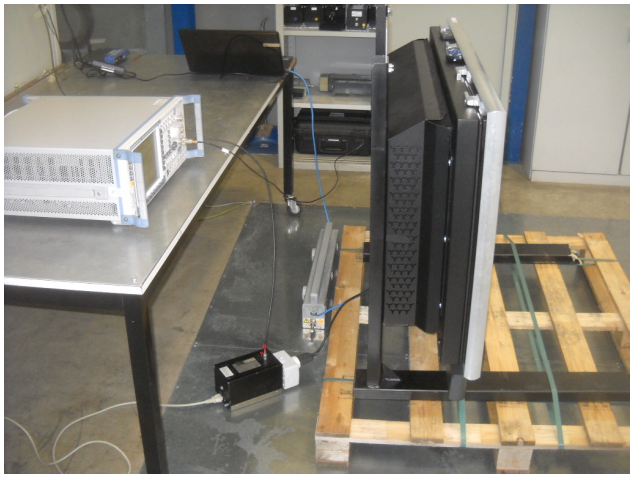
5.4.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
ESD Test system	EMC Partner	ESD3000	252

5.5 Immunity to radio-frequency continuous conducted

5.5.1 Photo documentation of the test set-up





5.5.2 Test method according to EN 61000-4-6

The test allows estimating of the conducted immunity of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 150 kHz to 80 MHz. The interference is applied on mains supply, signal line and earth connection ports by using coupling decoupling networks or a clamp. Measurements are made on a ground plane. The EUT was located 10cm above the reference ground plane and any associated I/O cables attached to the EUT are located between 30mm and 50mm above the ground plane. The indicated field is pre-calibrated prior to placement of the system under test.

5.5.3 Test specification

Frequency ranges:	0.15 ÷ 10 MHz	10 ÷ 30 MHz	30 ÷ 80 MHz
Test levels:	3 V	3 V to 1 V	1 V
Modulation:	AM with 80 % in depth and 1 kHz sine wave		
Frequency step:	1 % with 2 s dwell time		

5.5.4 Test result

Coupling point	Coupling and decoupling devices	Verdict
AC mains	M3	P
Ethernet line	EM-CLAMP	P

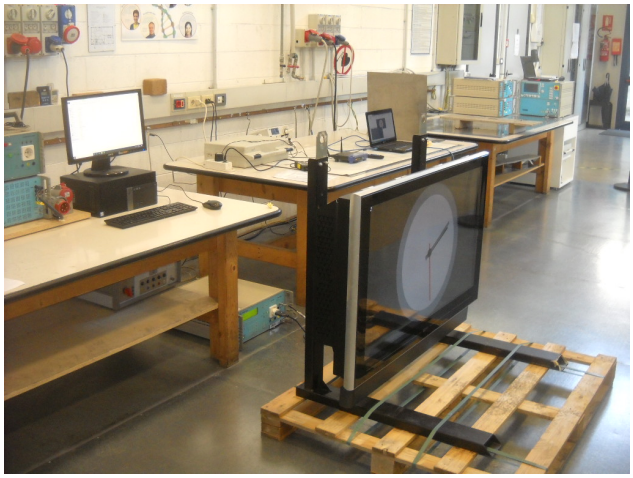
Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	A
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks: the performance criterion achieved during test was A, nothing happened during test.	

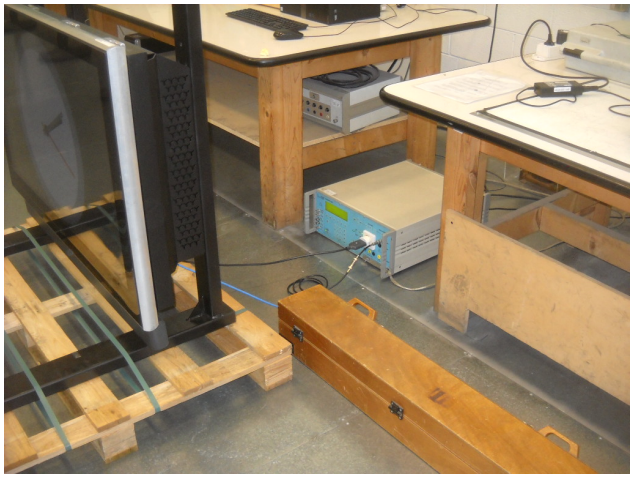
5.5.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Coupling/decoupling network	EM Test	CDN M2 / M3	0307-16
EM injection clamp	FCC	F203I-23mm	121239
RF Conducted immunity test equipment	EM Test	CWS500 CSI	V0710102305
Attenuator 6dB	EM Test	ATT6/75	0206-18
Shielded room	Siemens	Conducted immunity test room	68

5.6 Immunity to electrical fast transients/burst

5.6.1 Photo documentation of the test set-up





5.6.2 Test method according to EN 61000-4-4

The test is intended to demonstrate the immunity of equipment subjected to types of transient disturbances such as those originating from switching transients (interruption of inductive loads, relay contact bounce….). The bursts are applied on the mains supply port by using a coupling decoupling network and on signal and control lines ports by using a capacitive clamp. Measurements are made on a ground plane.

5.6.3 Test specification

Voltage level for analogue/digital data ports	0.5 kV	
Voltage level for DC network power ports	0.5 kV	
Voltage level for AC mains power ports	1 kV	
Burst frequency:	5.0 kHz	
Coupling duration:	≥ 60 s	
Polarity:	positive	negative

(for xDSL ports repetition frequency is 100 kHz)

5.6.4 Test result

Coupling point	Level	Coupling devices	Verdict
AC mains	± 1 kV	Network	P
Ethernet line	± 0.5 kV	Clamp	P

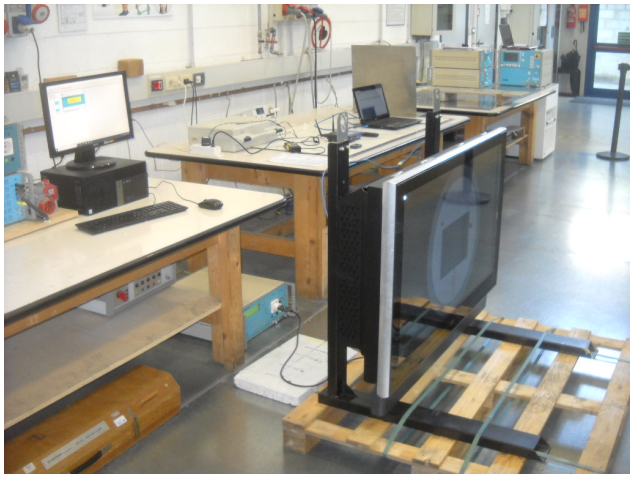
Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	B
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks: the performance criterion achieved during test was A, nothing happened during test.	

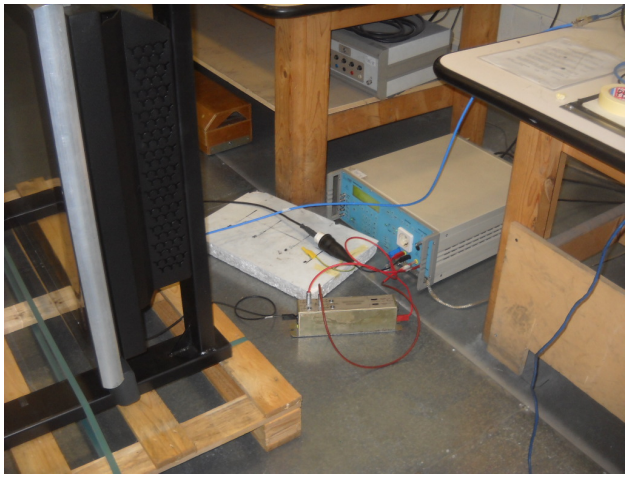
5.6.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Pulse generator	EMC partner	Transient 2000	849
Coupling clamp	Schaffner	CDN 125	245 9219

5.7 Immunity to surges

5.7.1 Photo documentation of the test set-up





5.7.2 Test method according to EN 61000-4-5

The test allows estimating of the conducted immunity of electrical and electronic equipment to unidirectional surges caused by over voltages from switching and lighting transients. The interference is applied on symmetrical and unsymmetrical modes on mains supply port by using coupling decoupling network. Five positive surges and five negative surges are applied at each of phases of the a.c. waveform: 0°, 90°, 180° and 270°. Each surge was applied 60 seconds after the previous surge. Signal and Telecommunications ports were subject to five positive and five negative surges applied through the appropriate Coupling/Decoupling Network (CDN).

5.7.3 Test specification for analogue/digital data ports

5.7.3.1 Port type: unshielded symmetrical – Apply: lines to ground

Pulse amplitude for line to ground surge:	1 kV	
Number of surges:	5 surges/polarity	
Repetition rate:	60 s	
Rise time:	10 µs	
Time to half value:	700 µs	
Polarity:	positive	Negative
Applicable only to ports which, according to the manufacturer's specification, support cable lengths greater than 3 m.		
Apply where primary protection is intended Surges are applicable to ports which satisfy all the following conditions: • may connect directly to cables that leave the building structure, • defined as an antenna port (3.1.3), a wired network port (3.1.34), or a broadcast receiver tuner port (3.1.8). Typical ports covered include xDSL, PSTN, CATV, antenna and similar. Excluded ports are LAN and similar.		

5.7.3.2 Port type: coaxial or shielded – Apply: lines to ground

Pulse amplitude for line to ground surge:	0.5 kV	
Number of surges:	5 surges/polarity	
Repetition rate:	60 s	
Rise time:	1.2 µs	
Time to half value:	50 µs	
Polarity:	positive	Negative
Applicable only to ports which, according to the manufacturer's specification, support cable lengths greater than 3 m.		
Apply where primary protection is not intended Surges are applicable to ports which satisfy all the following conditions: • may connect directly to cables that leave the building structure, • defined as an antenna port (3.1.3), a wired network port (3.1.34), or a broadcast receiver tuner port (3.1.8). Typical ports covered include xDSL, PSTN, CATV, antenna and similar. Excluded ports are LAN and similar.		

5.7.4 Test specification for Input DC network power port

Pulse amplitude for line to reference GND surge:	0.5 kV	
Number of surges:	5 surges/polarity	
Repetition rate:	60 s	
Rise time:	1.2 µs	
Time to half value:	50 µs	
Polarity:	positive	negative
Applicable only to ports which, according to the manufacturer's specification, support cable lengths greater than 3 m. Applicable only to ports which, according to the manufacturer's specification, may connect directly to outdoor cables.		

5.7.5 Test specification for Input AC power port

Pulse amplitude for line to line surge:	1 kV	
Pulse amplitude for line to ground surge:	2 kV	
Number of surges:	5 surges/phase angle	
Phase angle:	90°	270°
Repetition rate:	60 s	
Rise time:	1.2 µs	
Time to half value:	50 µs	
Polarity:	positive	negative
Applicable only to ports which, according to the manufacturer's specification, may connect directly to outdoor cables.		

5.7.6 Test result

Coupling point	Level	Coupling network	Verdict
AC mains – line to line	1 kV	2 Ω + 18µF	P
AC mains – line to earth	2 kV	12 Ω + 9µF	P
Signal port – shield to earth	1 kV	Direct	P

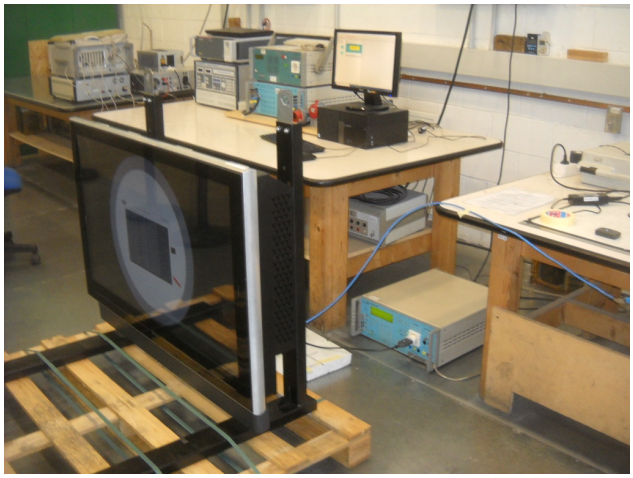
Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	B
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks: the performance criterion achieved during test was A, nothing happened during test.	

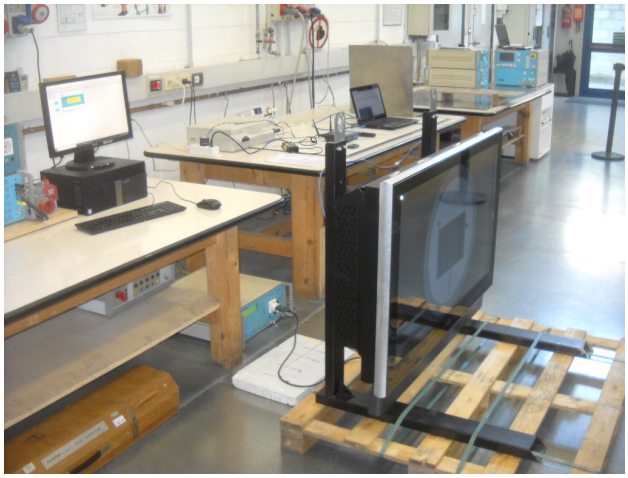
5.7.7 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Pulse generator	EMC partner	Transient 2000	849
Coupling network	Schaffner	CDN 116	149 9318

5.8 Immunity to voltage dips and interruptions

5.8.1 Photo documentation of the test set-up





5.8.2 Test method according to EN 61000-4-11

The test allows estimating of the conducted immunity of electrical and electronic equipment connected to low-voltage power supply networks for voltage dips and short interruptions. Testing is performed with the product connected directly to a generator capable of simulating the voltage drops and interrupts as described.

5.8.3 Test specification

Nominal Mains Voltage	230 Vac
Rated frequency	50 Hz and 60 Hz
Number of voltage dips and interruptions	3
Sync Angle	0°
Changes to occur at 0 degree crossover point of the voltage waveform. If the EUT does not demonstrate compliance when tested with 0 degree switching, the test shall be repeated with the switching occurring at both 90 degrees and 270 degrees. If the EUT satisfies these alternative requirements, then it fulfils the requirements. This condition shall be recorded in the test report	

.

5.8.4 Test result

	Level of reduction	Residual voltage	Duration	Performance criterion	Verdict
1	100%	0%	10 ms	B	P
2	30%	70%	500 ms	C	P
3	100%	0%	5 s	C	P

Verdict:	☒ P ☐ F ☐ N
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks: the performance criterion achieved during test was A, nothing happened during test, except for test 4 in which the EUT switch off.	

5.8.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Pulse generator	EMC partner	Transient 2000	849

5.9 Immunity to power-frequency magnetic fields

5.9.1 Photo documentation of the test set-up

5.9.2 Test method according to EN 61000-4-8

This test is intended to demonstrate the immunity of equipment when subjected to power frequency magnetic fields. The test magnetic field is obtained by a current flowing in an induction coil; the application of the test field to the EUT is by the immersion method.

5.9.3 Test specification

Test frequency:	50 Hz and 60 Hz		
Continuous field intensity:	1 A/m		
Duration (Continuous field):	60 s each Axis		
Axis:	x-axis	y-axis	z-axis

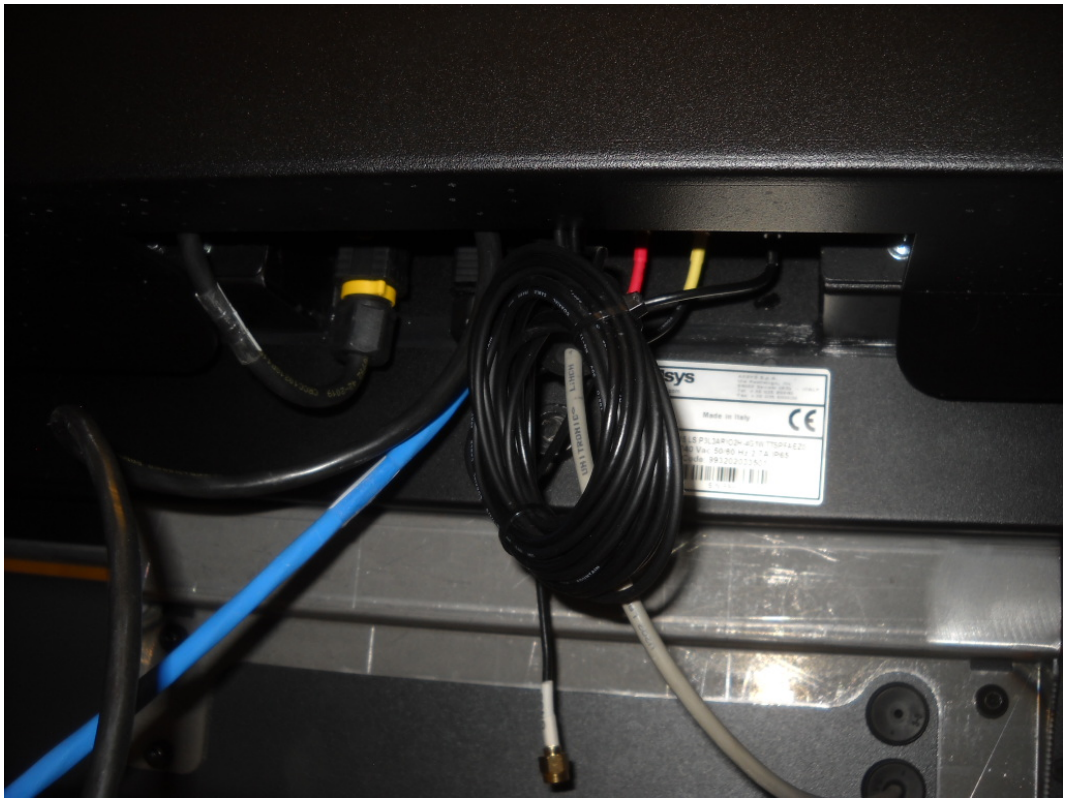
5.9.4 Test result

Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	A
Operation mode:	1
Configuration mode:	1
Kind of test site:	Helmholtz coils
Remarks: the performance criterion achieved during test was A, nothing happened during test.	

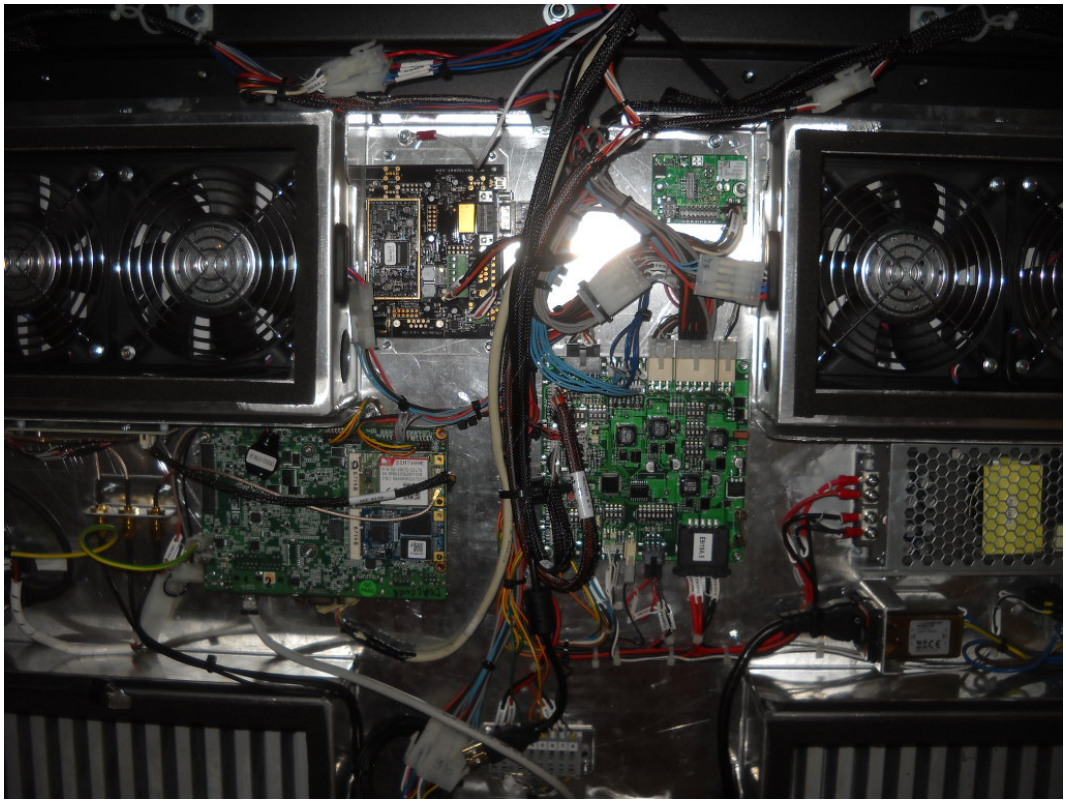
5.9.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Field strength meter	Maschek	ESM-100	971909-G
Transformer 240/24 V 2.5 KVA	Eletras	220/24	2.459
Variac	RS	WCV 8E-1	3/122017
Helmholtz induction coil antenna	G.I.E.	IEC 1000-4-8	111962
Field strength meter	Maschek	ESM-100	971909-G

6 EUT PHOTOS



aesys
Made in Italy
CE



End of report